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WHAT IS CLAIMED IS:

- A method for selectively inhibiting proliferation of a hematopoietic cell comprising 1. contacting a hematopoietic cell which ectopically expresses a gene encoding a mutated macrolide binding protein (MBP) with a macrolide which selectively induces macrolide-dependent inhibition of proliferation of cells expressing the mutated MBP compared to cells expressing a wild-type form of the MBP, the mutated MBP having an altered macrolide-binding specificity relative to the wildtype form MBP.
- 10 2. A method for selectively inhibiting proliferation of a hematopoietic cell comprising
 - (i) causing, in the cell, the ectopic expression of an MBP gene encoding a mutated macrolide binding protein (MBP) having an altered macrolide-binding specificity relative to a wild-type form of the MBP, which mutated MBP retains the ability to cause macrolide-dependent inhibition of proliferation; and
 - (ii) contacting the cell with a macrolide which selectively binds to the altered MBP relative to the wild-type MBP and selectively induces macrolide-dependent inhibition of proliferation of cells expressing the mutated MBP relative to cells not expressing only the wild-type MBP.
 - The method of claim 2, wherein the MBP is selected from the group consisting of a 3. FRAP, an FK506-binding protein, a cyclophilin and a calcineurin.
 - The method of claim 2, wherein the mutated MBP has a dissociation constant, K_d , at least one order of magnitude less than the K_d of the wild-type MBP.
 - [′]5. The method of claim 2, wherein the mutated MBP has a dissociation constant, K_d, at least three orders of magnitude less than the K_d of the wild-type MBP.
 - The method of claim 2, wherein the MBP gene is present on an expression vector in the cell.
 - The method of claim 2, wherein the MBP gene is present in the cell as part of a viral expression construct.
- The method of claim 2, wherein the MBP gene is a homologous recombinant in the cells genomic DNA.
 - The method of claim 2, wherein the macrolide is an analog of rapamycin, FK506 or cyclosporin.

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- 10. The method of claim 2, wherein the MBP gene encodes a FRAP protein, and the macrolide is an analog of rapamycin.
- 11. The method of claim 2, wherein the MBP gene encodes an FK506 binding protein, and the macrolide is an analog of FK506 or rapamycin.
- The method of claim 2, wherein the MBP gene encodes a calcineurin protein, and the macrolide is an analog of FK506 or cyclosporin.
 - 13. The method of claim 2, wherein the MBP gene encodes a cyclophilin protein, and the macrolide is an analog of cyclosporin.
 - 14. The method of claim 2, wherein the cell is a mammalian cell.
 - 15. The method of claim 2, wherein the cell is a human cell.
 - 16. A method for selectively inhibiting proliferation of a transplanted hematopoietic cell comprising
 - (i) transplanting, into an animal, hematopoietic cells which ectopically expresses a MBP gene encoding a mutated macrolide binding protein (MBP), the mutated MBP having an altered macrolide-binding specificity relative to the wild-type form MBP
 - (ii) administering to the animal an amount of a macrolide sufficient to inhibit proliferation of the transplanted cells, which macrolide selectively induces macrolide-dependent inhibition of proliferation of cells expressing the mutated MBP compared to cells expressing a wild-type form of the MBP.
 - 17. The method of claim 16, wherein the MBP is selected from the group consisting of a FRAP, an FK506-binding protein, a cyclophilin and a calcineurin.
 - 18. The method of claim 16, wherein the mutated MBP has a dissociation constant, K_d , at least one order of magnitude less than the K_d of the wild-type MBP.
- 25 19. The method of claim 16, wherein the mutated MBP has a dissociation constant, K_d , at least three orders of magnitude less than the K_d of the wild-type MBP.
 - 20. The method of claim 16, wherein the MBP gene is present on an expression vector in the cell.
- The method of claim 16, wherein the MBP gene is present in the cell as part of aviral expression construct.
 - 22. The method of claim 16, wherein the MBP gene is a homologous recombinant in the cells genomic DNA.

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- 23. The method of claim 16, wherein the macrolide is an analog of rapamycin, FK506 or cyclosporin.
- 24. The method of claim 16, wherein the animal is a mammal.
- 25. The method of claim 24, wherein the animal is a human.
- 5 26. The method of claim 16, wherein the transplanted cells are autologous to the animal.
 - 27. The method of claim 16 or 26, wherein the transplanted cells comprise transplanted bone marrow.
 - 28. The method of claim 16 or 26, wherein the transplanted cells comprise hematopoictic stem cells.
- 10 29. The method of claim 16, wherein the ectopic expression of the MBP gene is transcriptionally regulated by a T-cell specific transcriptional regulatory sequence.
 - 30. The method of claim 16, wherein the animal is in an immunosuppressed state.
 - 31. A method for treating graft-versus-host disease in an animal by selectively inhibiting proliferation of transplanted hematopoietic cells, comprising
 - (i) prior to transplanting tissue containing hematopoietic cells, transducing at least a sub-population of hematopoietic cells of the tissue with a gene for ectopic expression of a mutated macrolide binding protein (MBP), the mutated MBP having an altered macrolide-binding specificity relative to the wild-type form MBP; and
 - (ii) subsequent to transplanting the hematopoeitic cells, administering to the animal an amount of a macrolide sufficient to inhibit proliferation of the hematopoeitic transplanted cells, which macrolide selectively induces macrolide-dependent inhibition of proliferation of the transplanted cells expressing the mutated MBP compared to endogenous cells of the animal.
- 25 32. An expression construct encoding a mutated macrolide binding protein (MBP) selected from the group consisting of FRAP, FKBP, cyclophilin and calcineurin, wherein the mutated MBP has an altered macrolide-binding specificity relative to the wild-type form MBP and, in the presence of a macrolide which binds the mutated MBP, induces macrolide-dependent inhibition of proliferation of a cell expressing the mutated MBP.
 - 33. A kit for for selectively inhibiting proliferation of a hematopoietic cell, comprising
 - (i) an expression construct for ectopically expressing an MBP gene encoding a mutated macrolide binding protein (MBP) having an altered macrolide-binding

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specificity relative to a wild-type form of the MBP, which mutated MBP retains the ability to cause macrolide-dependent inhibition of proliferation; and

- (ii) a macrolide which selectively binds to the altered MBP relative to the wildtype MBP and selectively induces macrolide-dependent inhibition of proliferation of cells expressing the mutated MBP relative to cells not expressing only the wild-type MBP.
- 34. A method of promoting engraftment and hematopoietic activity of a hematopoietic stem cell from a donor, comprising:
 - (a) inserting nucleic acid encoding a modified macrolide binding protein specific for a modified macrolide into a hematopoietic stem cell to produce a transformed hematopoietic stem cell;
 - (b) introducing the transformed hematopoietic stem cell into a recipient mammal, such that the modified cellular receptor cyclophilin is expressed; and,
 - (c) administering an effective amount of the modified cyclosporin to said recipient mammal.
- 35. Hematopoietic stem cells transfected with the expression construct of claim 32.
- 36. A T cell transfected with an expression construct of claim 32.

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